

REMARKS

Reconsideration of the present application is respectfully requested.

Claims 1-5 were pending in the present application. Through this amendment, claims 2-5 have been canceled, and claim 1 has been amended. Specifically, claim 1 has been amended to recite that the conductive metal oxide layer is formed of zinc oxide. Support for this amendment may be found in original claim 3, which has been canceled herein.

In the Office Action, the Examiner rejected claims 1, 2, 4, and 5 under 35 U.S.C. §102(b) as allegedly anticipated by JP 60-182123 (JP '123). The Examiner stated that JP '123 discloses a supercapacitor having the essential features of then-pending claims 1, 2, 4 and 5.

Through this Amendment, claims 2, 4 and 5 have been canceled, rendering those rejections moot. Claim 1 has been amended to include all features of previous claim 3, which was specifically not rejected as anticipated by JP '123. Since this claim was not rejected as anticipated by JP '123, it is respectfully submitted that amended claim 1 is likewise not anticipated by JP '123. Withdrawal of this rejection is therefore requested.

In the Office Action, the Examiner then rejected claims 1, 2, 4 and 5 under 35 U.S.C. §102(b) as allegedly anticipated by JP 02-001104 (JP '104). The Examiner stated that JP '104 discloses a supercapacitor having the essential features of then-pending claims 1, 2, 4 and 5.

Through this Amendment, claims 2, 4 and 5 have been canceled, rendering those rejections moot. Claim 1 has been amended to include all features of previous claim 3, which was specifically not rejected as anticipated by JP '123. Since this claim was not rejected as

anticipated by JP '104, it is respectfully submitted that amended claim 1 is likewise not anticipated by JP '104. Withdrawal of this rejection is therefore requested.

In the Office Action, the Examiner then rejected claims 1-5 under 35 U.S.C. §103(a) as allegedly obvious over Watanabe et al. (U.S. 4,783,723) in view of JP 01-227418 (JP '418). The Examiner stated that Watanabe discloses a supercapacitor including two electrodes, in which each of the electrodes is comprised of a current collector and an electrode active material, a separator between the electrodes, an electrolyte and a package. The Examiner acknowledged that Watanabe fails to disclose that the current collector has a conductive metal oxide layer thereon and the electrode active material is adhered on a surface of the conductive metal oxide layer. The Examiner relied upon JP '418 for its disclosure of a current collector having a conductive metal oxide layer. The Examiner acknowledged that JP '418 fails to disclose that the metal oxide layer is formed of zinc oxide, but stated that "it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the conductive metal oxide layer from zinc oxide."

Claim 1 has been amended, and claims 2-5 have been canceled. Claim 1 has specifically been amended to recite that the conductive metal oxide layer is formed of zinc oxide. The Examiner admitted that neither of Watanabe nor JP '418 discloses that the conductive metal oxide layer is made from zinc oxide. The Applicant submits that the use of zinc oxide was not obvious to one of skill in the art. Further, the Applicant has conducted experimental tests on the invention, and has clearly demonstrated that the use of zinc oxide as the metal oxide layer provides superior and unexpected results.

As set forth in Table 1 of the application as filed, the Applicant conducted several experiments to test various features of supercapacitors. Specifically, the Applicant conducted tests to determine the effect of using zinc oxide as the metal oxide layer. As is clearly evidenced at page 10 of the application as filed, the use of zinc oxide as the metal oxide layer provides superior and unexpected results in terms of electrode density, initial capacitance and initial resistance, and capacitance and resistance after 1000 h at 80°C. These test results were specifically compared against supercapacitors including tin oxide layers (which are formed through the use of sodium stannate) and supercapacitors having no metal oxide treatment. For example, supercapacitors incorporating zinc oxide exhibit a resistance of 10-12 mΩ, while those incorporating tin oxide exhibit a resistance of 15-16 mΩ, and those with no treatment exhibit a resistance of 25 mΩ. In addition, after 1000 h at 80°C, supercapacitors using zinc oxide have a resistance of 11-12 mΩ, those using tin oxide have a resistance of 18-20 mΩ, and those with no treatment have a resistance of 40 mΩ.

Based on the experimental data above, supercapacitors using zinc oxide show a marked improvement over those using tin oxide (as well as those using no metal oxide). For example, after 1000 hours, supercapacitors using tin oxide have a resistance that is almost double that of supercapacitors using the presently-claimed zinc oxide layer. Such significant improvement demonstrates a “greater than expected result” and supports a finding of unexpected results. MPEP §716.02(a)(I). Further, the use of zinc oxide demonstrates a superior property than that of JP ‘418 in particular, which constitutes additional evidence of non-obviousness. MPEP §716.02(a)(II).

Neither Watanabe nor JP '418 disclose the use of a supercapacitor using a zinc oxide layer. Further, given the demonstration of unexpected and superior results in using the claimed zinc oxide layer, it is submitted that claim 1 as pending is patentable over Watanabe and JP '418, whether taken alone or in combination. Withdrawal of this rejection is respectfully requested.

Next in the Office Action, the Examiner rejected claim 3 under 35 U.S.C. §103(a) as allegedly obvious in view of JP 60-181123 (JP '123). The Examiner stated that JP '123 discloses the claimed invention, however the Examiner admitted that JP '123 does not disclose that the conductive metal oxide layer is formed of zinc oxide. The Examiner alleged that it "would have been obvious to one having ordinary skill in the art at the time the invention was made to form the conductive metal oxide layer from zinc oxide."

As explained above, the Applicant has set forth clear unexpected and superior results. Given these unexpected results, in view of the fact that JP '123 does not disclose or suggest the use of zinc oxide, it is submitted that claim 1 as pending is patentable over JP '123. Withdrawal of this rejection is respectfully requested.

Finally, in the Office Action, the Examiner rejected claim 3 under 35 U.S.C. §103(a) as allegedly obvious over JP 02-001104 (JP '104). Similarly to that set forth above, the Examiner admitted that JP '123 does not disclose that the conductive metal oxide layer is formed of zinc oxide. The Examiner alleged that it "would have been obvious to one having ordinary skill in the art at the time the invention was made to form the conductive metal oxide layer from zinc oxide."

Applicants: Roh
Serial No.: 10/567,243
Filing Date: February 6, 2006
Docket No.: 1508-10 PCT/US
Page 7

As explained above, the Applicant has set forth clear unexpected and superior results. Given these unexpected results, in view of the fact that JP '104 does not disclose or suggest the use of zinc oxide, it is submitted that claim 1 as pending is patentable over JP '104. Withdrawal of this rejection is respectfully requested.

The Applicant has now responded in full to the pending office action. Favorable action thereon is respectfully requested. Should the Examiner have any questions or require further information, the Examiner is welcome to contact the Applicant's representative at the below number.

Respectfully submitted,

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